Presentation to U.S. EPA Region 5 by the Trustees of the Environmental Conservation and Chemical Corporation Site Trust Fund

THE RRA AT THE ENVIRO-CHEM SITE ZIONSVILLE, INDIANA

Prepared by:

Versar INC.

In Association With:

Handex ®

14 August 1997

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1.0 Introduction

The Environmental Conservation and Chemical Site (Enviro-Chem) Trust Fund has made a preliminary selection of VERSAR/HANDEX to support the Trustees in the design and implementation of the Revised Remedial Action (RRA) at the Superfund site in Zionsville, Indiana. The VERSAR/HANDEX Team brings more than $1 billion in engineering design, construction and operation & maintenance experience to the Trust Fund in support of the RRA. The Team has local offices in Indianapolis and Chicago that are tied to a national support network of more than 35 offices and more than 1,250 people.

2.0 Overall Objective of the 14 August '97 Meeting

This handout has been prepared by the VERSAR/HANDEX Team for the Enviro-Chem Trust Fund to **obtain U.S. EPA's conceptual-level concurrence with the proposed preliminary soil vapor extraction (SVE) design**, presented in this handout.

3.0 Major RRA Activities

The VERSAR/HANDEX Team's support of the Trust Fund will be comprised of five major actions; these five major actions are identified below:

- Preliminary SVE System Design
- Final SVE System Design (including integration of the previous U.S. EPA approved 100 percent design for the wastewater treatment system)
- Construction
    - Wastewater Treatment System
    - Concrete Pad Demolition, Sheet Piling Installation, Excavation, Backfill & Placement of the Excavated Materials on the SVE Treatment Area
    - SVE System

- O & M of the Remedial Systems
  - Wastewater Treatment System
  - SVE System
- Final RCRA Cap & Site Closure Activities After Achievement of the Clean-up Objectives

4.0 Preliminary Design of the SVE System

4.1 Major Features of the Preliminary SVE Design

The VERSAR/HANDEX Team's design is conservative and meets or exceeds the design basis identified in Revised Exhibit A (Revision 1). Enhancements to the design basis have been incorporated to improve performance efficiency and reduce the anticipated field time during both the construction and operational phases of the SVE treatment system. The major features include:

- A trench based SVE vent pipe design that is segregated by an impermeable synthetic membrane into two treatment zones for native and excavated soils, respectively. This trench based design should eliminate any need for a supplemental Explanation of Significant Difference (ESD).

- A preliminary design for the vent pipes that places them on a uniform grid pattern with 30 foot centers (15 foot radius of influence). This design is closer, (i.e., more conservative) than the 18 foot radius of influence design specified in Revised Exhibit A (Revision 1).

- The blower capacity for the system will be 2400 SCFM at 10 inches of Hg. This is 12 times greater than the 200 SCFM specified and is capable of developing a vacuum of 20 inches of Hg minimum, as identified in Revised Exhibit A (Revision 1).

- The SVE system should have a zone of influence of more than 17 feet below grade, which is eight feet greater than the effective minimum of nine feet treatment depth, required in Revised Exhibit A (Revision 1).

- The treatment system incorporates flow control (down to the individual vent pipe system level) and air reinjection to optimize removal of constituents of concern. This will allow for hot spot removal early on, isolation of clean-up areas and minimizes infiltration of fresh air through the cap.

- Trenches for each vent pipe will be equipped with dewatering well points attached to a system of three electrical diaphragm pumps to assure that subsurface till water infiltration to the trenches does not impede system performance.

- The off-gas from the vapor phase treatment system will be monitored with an infrared unit that can be factory calibrated for indicator constituents of concern and be more reliable than a PID unit that relies on an ionization source that is prone to burn-outs, that was specified as a minimum in Revised Exhibit a (Revision 1).

- Two stage water removal has been incorporated into the SVE treatment design to handle the high relative humidity that is anticipated.

- The first stage water removal device, the air/water separator, will be equipped with an extraction pump to remove water as it is accumulated, while under vacuum. This is an improvement since it allows continuous operation of the SVE system, whereas Revised Exhibit A (Revision 1) contemplates stopping the SVE system to empty water U.S. EPA's concurrence with this improvement can be handled through a clarification of Revised Exhibit A (Revision 1) page 9.

4.2 Preliminary SVE Design Details

The VERSAR/HANDEX Team's proposed preliminary SVE system design includes the following details:

a. Fifty-four SVE trenches will be installed within the native soils of the Northern and Central SVE treatment areas, see VERSAR drawing, sheet 1. The zone of influence for the treatment system in the native soil is greater than 17 feet below grade (i.e., vent pipes installation at two feet plus a radius of influence for the each vent of more than 15 feet for a total zone of influence of 17 feet), which is more than the nine foot effective minimum depth for treatment design basis specified in Revised Exhibit A (Revision 1). Each trench will be excavated to a depth of eight feet below grade and then back-filled. The vent pipes will be installed at a depth of two feet below grade. The trenches will be 40 feet long and backfilled with a high permeability gravel. The vent pipes will be two inch well screen, see VERSAR drawing, sheet 2. The trenches will be installed approximately 30 feet apart, allowing a venting radius of 15 feet from each trench area. Only two 2-inch trench screens will be connected to one 3-inch extraction line. Each of the 3-inch extraction lines will run directly to an influent header within the SVE blower building.

b. Given the variable nature of the groundwater at the site, each trench within the native soils will include a dewatering point. The dewatering points will be constructed of PVC well screen with a dual-layer factory sealed outer covering. The outer covering acts as a "well gravel" to minimize incrustation of finer soils and inorganics onto the well screen.

c. An additional 26 SVE trenches will be installed within the upper section of the Northern treatment area. These trenches will be installed within the relocated soils from the southern excavation, see VERSAR drawing, sheet 3. The upper trenches will be isolated from the lower trenches, however, they will be constructed in a similar fashion. Two trench vents will be attached to one 3-inch extraction line. Each of the 3-inch extraction lines will run to an influent header in the SVE building. Due to the smaller volume of soil within the upper area, the trenches will extend only to one foot above the native soils or to a depth of approximately six feet. Also due to the anticipated higher permeability caused by reworking of the soils, the upper trenches will be approximately 50 feet long.

d. Dewatering of the upper section of the northern treatment area will occur through operation of the SVE system. Since these soils are above grade, no supplemental well point dewatering system is required.

e. Based on the SVE test data, soil vapors will be extracted from each SVE trench at an average of 30 SCFM. This yields an initial total air removal rate from the site of approximately 2,400 SCFM supplied by two 1,200 SCFM blowers. This is significantly higher than the minimum 200 SCFM air removal rate specified within Revised Exhibit A (Revision 1). Long term contaminant removal will be based on pore volumes of air removed. The initial proposed flow rate of 2,400 SCFM allows the system to reach a removal of approximately 400 pore volumes within the first two months of operation. This high initial flow rate should help to address the contaminants "trapped" within the diffusion limited zones across the site. After the 400 pore volume removal occurs, discharge will vary between approximately 1,200 to 2,400 SCFM based upon flow rates required to efficiently remove constituents of concern within diffusion limiting zones across the site.

f. Given the proposed 40 point SVE influent manifold, long term operational flexibility is assured. It is anticipated that at least 10% of the extraction trenches will reach an acceptably "clean" level within the first months of operation. Once these trenches meet acceptable vapor levels, the manifold may be easily modified by the system operator to allow air injection to these "clean" trenches, see VERSAR drawing, sheet 4. This reinjection will minimize short-circuiting of fresh air through the cap and therefore improve over-all removal efficiencies. In similar situations air intrusion to a capped system is through a distinct air pathways. Unless air is injected or vented along alternate pathways, contaminated soil outside of the "normal" air intrusion path will not be remediated by vapor extraction. Six months of system operation, passive venting or active injection of air on a varied schedule will facilitate the success of the project.

g. The proposed extraction system includes two 1,200 SCFM, 50 HP blowers. These relatively large blowers have been chosen to remove as large a portion of contaminants in as short a period of time as possible. After a given time, the required air removal rate will decline as "clean" trenches are shut off. The choice of two blowers allows the flexibility to take one blower out of service, while maintaining the second blower as an identical spare. Although the previous testing indicates a vacuum rate of less than three inches of Hg is required, the blowers are capable of a minimum vacuum pressure of 20-inches of Hg . The higher vacuum rate is in part to satisfy the requirements of Exhibit A and also in part to account for the more difficult intrusion of fresh air into the system once the site is capped.

h. It is anticipated that the soil vapors from the trenches in the native portion of the site will be high in humidity. At the anticipated flow rate of 1,800 SCFM from the lower trenches and a relative humidity of approximately 80%, the extracted soil vapors will include approximately 320 gallons of water per day. Our proposed design includes two water removal systems to capture the condensate water prior to the vapor phase carbon system. The primary removal device is the air/water separator which has level switches to start and stop an extraction pump to remove the accumulated water. Once removed, the condensate water will be equalized and transferred to the T-1 influent tank for treatment.

i. The design also includes flexibility in the use of a 1,500-gallon equalization tank within the SVE enclosure. Should the wastewater plant be shut down for a period of up to four days, the equalization tank will provide additional storage of the condensate water. This allows scheduling of a disposal service or time to restart the wastewater system without impacting the operation of the SVE system.

j. The dewatering points from the trenches in the lower area will be connected to three unique extraction manifolds, see VERSAR drawing sheet 4. The extraction manifolds will be connected to three electric diaphragm pumps (EDP's). The EDP's will be controlled by a Programmable Logic Controller integrated with the SVE system. The suction pumps will operate on a timer and vacuum basis. On a daily time cycle each of the pumps will operate on an individual point for a minimum of three minutes, or a time set by the operator. If there is no water within the trench, a vacuum switch will signal for the PLC to close the suction valve for the specified line. If water is encountered within the line, the pump will create a vacuum signaling the PLC to allow the pump to continue to operate. Three pumps were chosen for redundancy and to provide dewatering during periods of very high water. If required, each EDP can recover up to 15 gallons per minute, for a total dewatering rate of 45 gpm from the native soils.

k. Treatment of the recovered vapors is proposed in two phases. Initially, two large granular activated carbon/vapor phase carbon "vapor packs" of 13,000 pounds each would be used in series for the first three months of system operation. The vapor packs will provide operation of the SVE system without shut down periods for carbon replacement during the "hottest" period of vapor removal. Once vapor concentrations stabilize, two pair of smaller 3,000-pound vapor carbon units would be installed. Each of the smaller units can accommodate an air flow up to 1,500 cfm. As the system influent begins to decline and individual extraction trenches "clean up", two 3,000-pound GAC's will be sufficient.

l. The vapor removal and off-gas quality will be monitored by a fixed station photoacoustic infrared monitoring unit. The infrared unit is better suited to the proposed project as an upgrade to the PID unit specified as a minimum design basis within Revised Exhibit A (Revision 1) page 8. Given the variety of contaminants, both a PID and the infrared unit will yield varying responses to different compounds. The advantage to the infrared unit, however, is that it is manufactured and factory calibrated for the proposed compounds in the vapor stream. In addition, the PID unit is based on the ionization potential of the compound and the corresponding ionization potential of the photo-bulb. As an example, 1,1,1-Trichloroethane (TCA) cannot be ionized by a standard 10.7 eV photo-bulb. The ionization potential for 1,1,1-TCA is greater than 11.2 eV, thus a "special duty" bulb is required. This 11.2 eV photo-bulb is less reliable because it has a significant lower use-life and requires frequent change-outs.

5.0 Integration of WWT and SVE Designs

The VERSAR/HANDEX Team has performed a value engineering analysis that identified design modifications and integration improvements that would improve the constructability and/or facilitate the operation of the SVE and WWT systems for the RRA. These enhancements include:

1. Use of the crushed concrete pad and recovered sub-base materials to back-fill trenches for the SVE system vacuum vents. Approximately 900 cubic yards of crushed materials (i.e., smaller than three inches in diameter) would be utilized to backfill the SVE system trenches with the remainder being deposited in the segregated treatment zone identified in Revised Exhibit A (Revision 1). This modification would result in this material now receiving the highest degree of treatment possible, because it is the closest contact material to the SVE system vents. In addition, the overall volume of material to undergo treatment would be decreased by approximately 900 cubic yards. as a direct result of the aggregate fill that would not now be required around the SVE system vents. This lesser volume would also decrease the overall size of the temporary and final caps for this area. The action will require no change in the text of Revised Exhibit A (Revision 1), but will require revision to drawing 2-2.

2. Shop fabrication of the SVE treatment system on skid or trailer mounts that could be delivered to the site with either an integrated enclosure system or driven into a prefabricated building. This action will not require a change to Revised Exhibit A (Revision 1). The final SVE design will incorporate changes to the building for the SVE treatment system to accommodate the skid mounted units. This would reduce field installation time and assure high quality construction. In addition, the demobilization of the systems at the project completion would be reduced, and the systems may also have

some salvage value.

3. Shop fabrication of the WWT system on skid or trailer mounts that could be delivered to the site with either an integrated enclosure system or driven into a prefabricated building. This action will not require a change to Revised Exhibit A (Revision 1). The only modification to the approved 100 percent design that would occur, would be the design of the building for the WWT system to accommodate the skid mounted units. Building modifications to accommodate the skid mounted units will be performed concurrently to the SVE system design finalization. This would reduce field installation time and assure high quality construction. In addition, the demobilization of the systems at the project completion would be reduced, and the systems may also have some salvage value.

4. Preordering long-lead delivery equipment and tanks for the WWT system, prior to U.S. EPA's "second look" review and approval of the final SVE system. This action will not require a change to Revised Exhibit A (Revision 1). This would allow for increased construction activity earlier on (system shakedown and concrete pad demolition and excavation). Our initial estimate is that the schedule could be reduced by as much as two months.

5. Integration of the vapor phase carbon systems for both the SVE and WWT system. This action will not require a change to Revised Exhibit A (Revision 1). This option was specified on the 100 percent design drawings for the WWT system as a contractor option. It would eliminate the need for duplicate vapor phase carbon systems.

During our preliminary design development we noted an ambiguity in Revised Exhibit A (Revision 1), reference page 10 (third paragraph under Carbon Adsorption System). Revised Exhibit A (Revision 1) states, "When the organic analyzer detects organic vapor in the airstream between the primary and secondary carbon vessels, the vacuum extraction system will shut down automatically to permit the removal and replacement of the "spent" primary carbon vessel." This could be construed to mean that any break-through detected from the primary vessel to the secondary, regardless of how small it is, even if it is below IDEM air discharge limits, would require the replacement of 3000 pounds of carbon in the primary vessel. This makes no sense from an engineering stand-point. It means that there is no need for a secondary carbon vessel since it will never see contaminates. A conservative clarification to this language, that will still meet IDEM's air discharge limitations, would be that the change-out would occur at the point when 50 percent of the IDEM discharge limitation occurred at the air discharge point of the primary carbon vessel. We believe that Revised Exhibit A (Revision 1) page 10 needs to be clarified or interpreted through a letter agreement to cover this point.

6. Replace the purchase of two of the four storage tanks with a short term lease of two identical size tanks. This action will not require a change to Revised Exhibit A (Revision 1). Reevaluation of the required tankage for the WWT system identified that it was based upon a conservative assumption that the required storage tank volume required during the first four months of site operation, when dewatering was occurring, would be available throughout all field activities. Since dewatering is minimal during the SVE operation phase, the storage tank capacity can be decreased from four to two tanks after four months when the construction phase dewatering has been completed.

7. Utilize the three indicator parameters set forth below to track SVE system performance at the trench level. The parameters have been selected from each of the three major chemical groups, i.e., ketones, aromatics and VOX's. The selected indicator in each group has the lowest Table 3-1 level. The indicator parameters are methyl ethyl ketone, ethyl benzene and 1,1,2-trichloroethane.

8. Utilize two portable WWT systems with the same treatment process and of higher design flow than the permanent WWT system approved in the 100 percent design. Each of the portable systems would have a through-put capacity of 35 gpm for a total capacity of 70 gpm, (i.e., 20 gpm greater than 100 percent design of 50 gpm) . Both systems would be operational during the initial site dewatering and excavation. Upon completion of these activities, when a significantly lower volume of water will require treatment, one of portable units will be removed from the site. This operational scenario will provide greater treatment capacity earlier on when the potential for it need is greatest and diminish the amount of on-site equipment during the SVE treatment system operational phase, when the water treatment volume will be minimal.

Table 1 summarizes potential savings associated with the modifications that have been identified during preliminary engineering of the SVE system and it's integration with the WWT system.

Table 1

Savings Associated With The Integration Of The SVE And WWT System Designs

Item	Option	Savings	Comments
1	Use of crushed concrete from pad demolition in place of off-site aggregate for SVE trenches	$35,000	Saves importing from off-site ~900 CY of stone .
2	Prefabricate SVE system off-site	$40,000	Shop fabrication saves field time and costs.
3	Prefabricate permanent WWT system off-site	$60,000	Shop fabrication saves field time and costs.
4	Preorder long-lead delivery equipment and tanks	$125,000	Saves two months field time and Construction Management costs.
5	Integrate vapor phase carbon for WWT & SVE systems	$40,000	Eliminates purchase of a duplicate carbon system for WWT vapors.
6	WWT tankage (build two and rent two for four months)	$31,250	After four months of de-watering, quantity reduces significantly, allowing for a decrease in tank capacity. In addition, a 28 mil PVC liner will be utilized on the two rented tanks (four months) .
7	Use of indicator parameters for sampling	$20,000	Saves lab analysis costs.
8[1]	Use two portable WWT system of greater capacity (70 gpm) than the permanent WWT system (50 gpm) in the 100 percent design.	$50,000	Matches WWT capacity to required water treatment volumes at varying times in the project.
Total Savings		$401,250	

Note:

1. Using two 35-gpm WWT systems, one 35-gpm portable WWT system (purchased) and one 35-gpm portable WWT system (rented, as needed) that use the same technology as the prefabricated permanent plant. After the site dewatering during construction, when the water in tanks is treated, the second portable system will leave the site (and be used elsewhere). Storage tankage associated with this option is discussed in item # 6 above.

APPENDIX

Appendix

In developing our preliminary design, the VERSAR/HANDEX Team re-evaluated the SVE testing data compiled by Terra-Vac and ERM, Inc. These treatability data and associated analyses were utilized in conjunction with the project goals. The four major points analyzed for an SVE system are the following:

- Air flow required from the subsurface to remediate the area of concern.
- Required vacuum level to both remove sufficient air and volatilize contaminants.
- The approximate time frame required to reach diffusion limited contaminant removal rates.
- Design provisions to enhance the rate of diffusion once the period of diffusion limited contaminant removal is reached.

Some specific points of interest from the treatability data include:

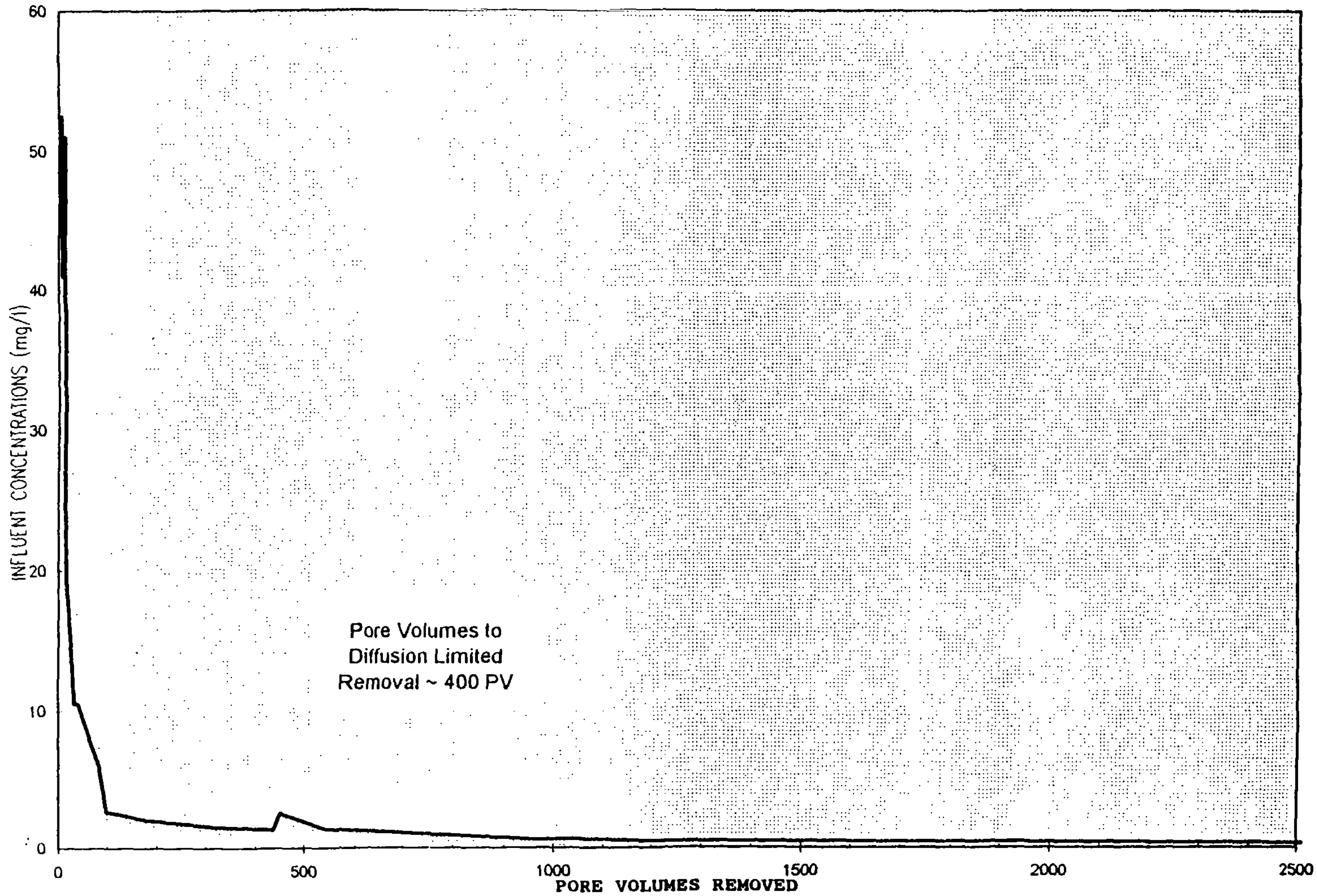
- **Flow Rate vs. Contaminant Removal Analysis (see graph #1)**

  The equivalent pounds of contaminant removal versus various air flow rates was evaluated for the test on HEW-1. The graph identifies that the pounds of contaminant removal from the trench was maximized at an air flow rate of approximately 40 SCFM.. At correspondingly higher air flow rates, the pounds of contaminants removed remained relatively constant.

- **Vacuum Pressure vs Flow Rate Analysis (see graph # 1)**

  Exhibit A specifies the final SVE system must be capable of 20-inches of Hg vacuum. The vacuum rate necessary to remove soil vapor is a function of the soil mechanics. The applied vacuum levels from the HEW-1 test versus air removal rates was graphed. Based on the treatability data, a vacuum of less than 3-inches of Hg was required to remove an air flow rate of over 300 SCFM. Given the maximum contaminant removal occurs at approximately 40 SCFM, a maximum vacuum level of 6-inches of Hg per point is required.

INFLUENT CONCENTRATIONS vs. PORE VOLUMES OF AIR REMOVED



- **Analysis of Diffusion Limited Contaminant Removal (see graph # 2)**

The influent concentrations from HEW-1 stabilized to a rate of less than 5% of the initial influent concentrations after approximately 400 pore volumes of air were removed. This is significant in that the test on HEW-1 was run for over 4,000 pore volumes. This indicates that diffusion limited contaminant removal from the native formation will occur after approximately 400 pore volumes of air are removed.

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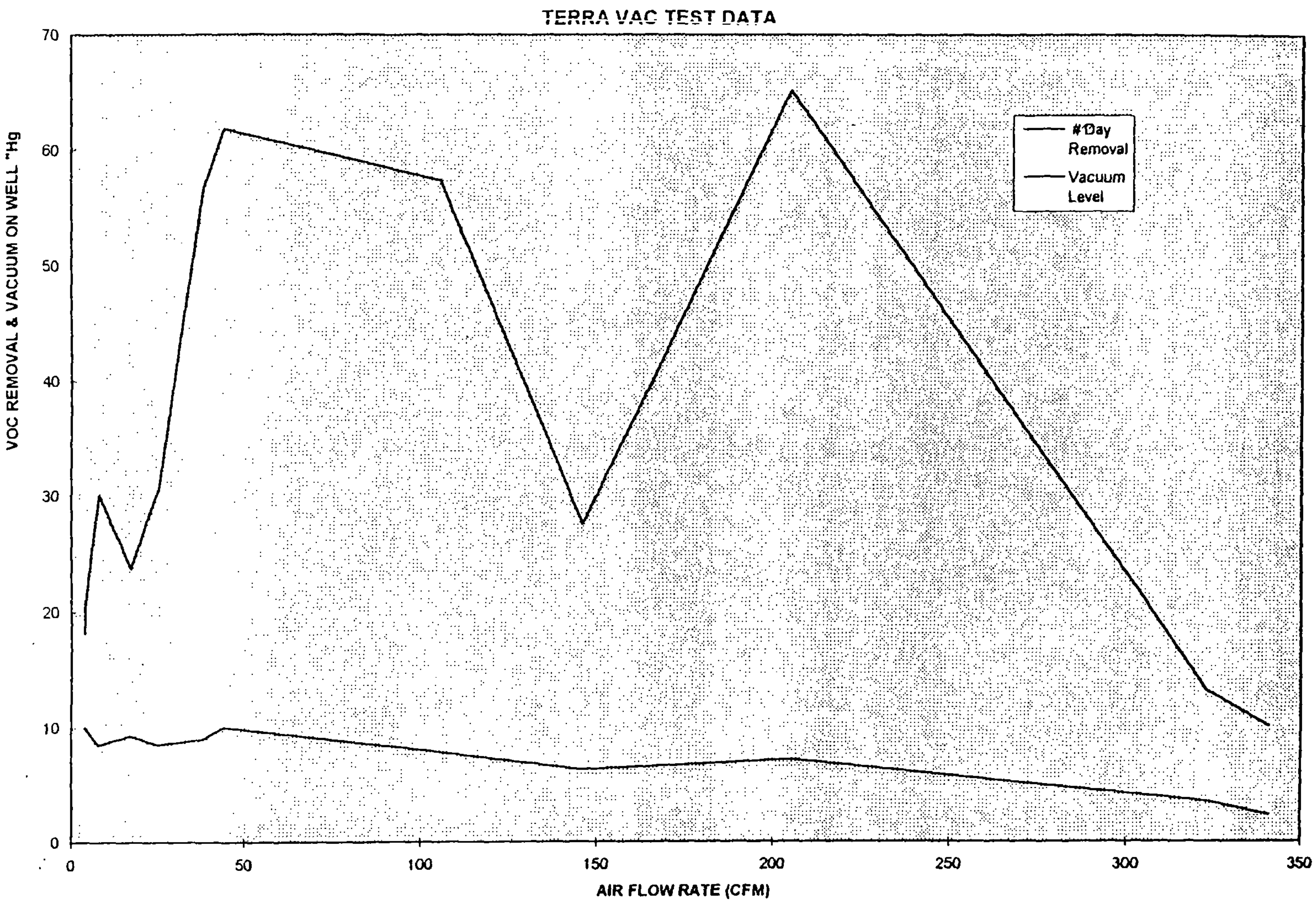

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MAY 7, 1997
REVISON 1
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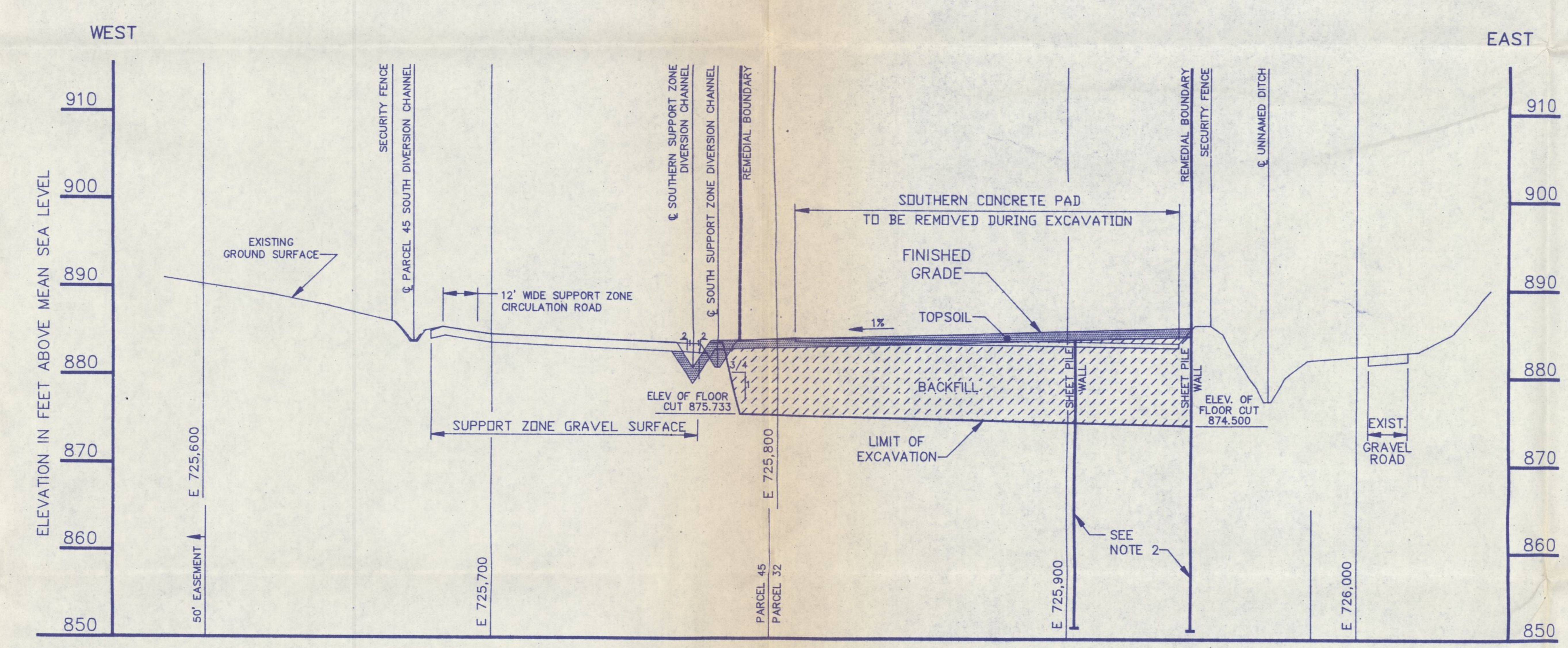
FIGURE 2-1

REMEDIAL ACTIVITY AREA
ECC SITE
ZIONSVILLE, INDIANA

SOURCE: DOW ENVIRONMENTAL DRAWING G-1, REVISION 0 DATED 11/10/95.

SITE CROSS SECTION AT E 725,860 (SEE NOTE 1)

LOOKING EAST



SITE CROSS SECTION AT N 921,700 (SEE NOTE 1)

LOOKING NORTH

NOTES:

1. CROSS SECTION LOCATIONS ARE SHOWN ON DRAWINGS G-2, AND C-1 THROUGH C-7.

2. THE SHEET PILE CUTOFF WALL DEPTH SHALL BE A MINIMUM OF 24 FEET BELOW THE FLOOR ELEVATION OF THE EXCAVATION. THE SHEET PILE CUTOFF WALL SHALL BE EXTENDED THROUGH AND TO THE BASE OF THE UNDERLAYING SAND WATER-BEARING ZONE IN ORDER TO REDUCE EXCAVATION DEWATERING VOLUMES. ADDITIONAL FIELD SUBSURFACE INVESTIGATIONS TO BE CONDUCTED BY THE CONTRACTOR IN ACCORDANCE WITH THE SPECIFICATIONS MAY RESULT IN MODIFICATIONS TO THE EXCAVATION DEPTH AND SHEET PILE CUTOFF WALL ALIGNMENT AND DEPTH.

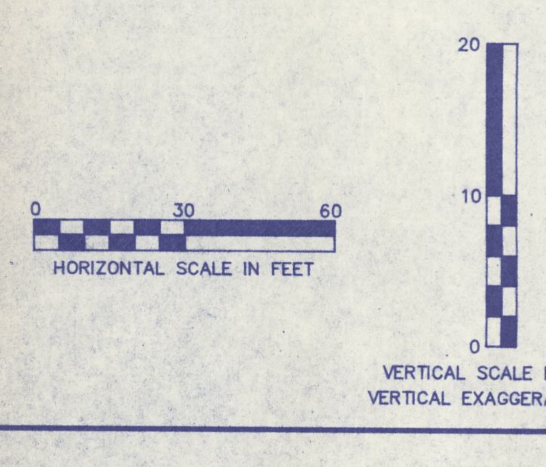


FIGURE 2-2

SITE CROSS SECTIONS ENVIRO - CHEM SITE ZIONSVILLE, INDIANA

SOURCE: DOW ENVIRONMENTAL DRAWING C-10, REVISION 0 DATED 11/10/95.

FIGURE 2-3

GENERAL PROCESS AND INSTRUMENTATION DIAGRAM ECC SITE ZIONSVILLE, INDIANA

SOURCE: RADIAN INTERNATIONAL FIGURE NUMBER 2-3, DATED 5/20/97.

FIGURE 2-3

GENERAL PROCESS AND INSTRUMENTATION DIAGRAM ECC SITE ZIONSVILLE, INDIANA

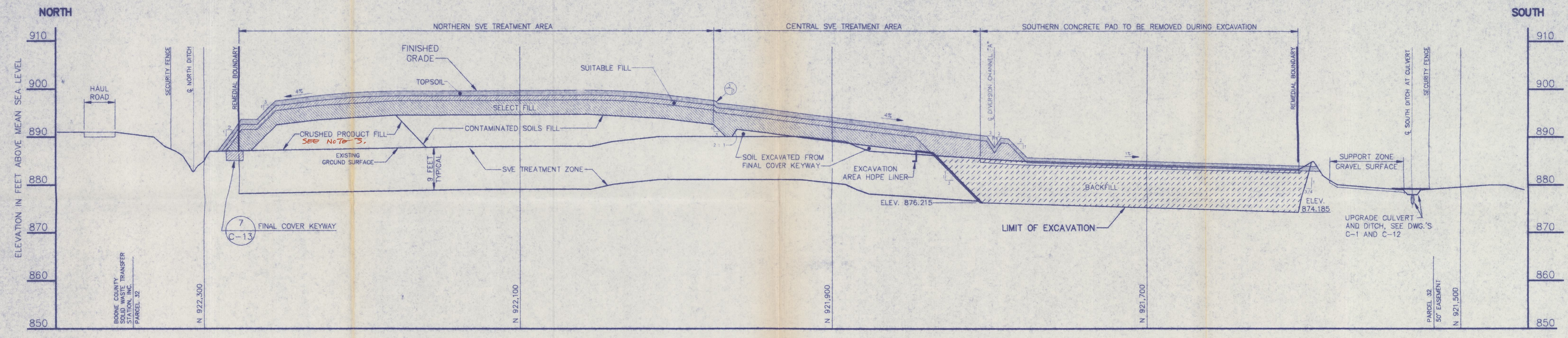
VERSAR/HANDEX

SOURCE: RADIAN INTERNATIONAL FIGURE NUMBER 2-3, DATED 5/20/97.

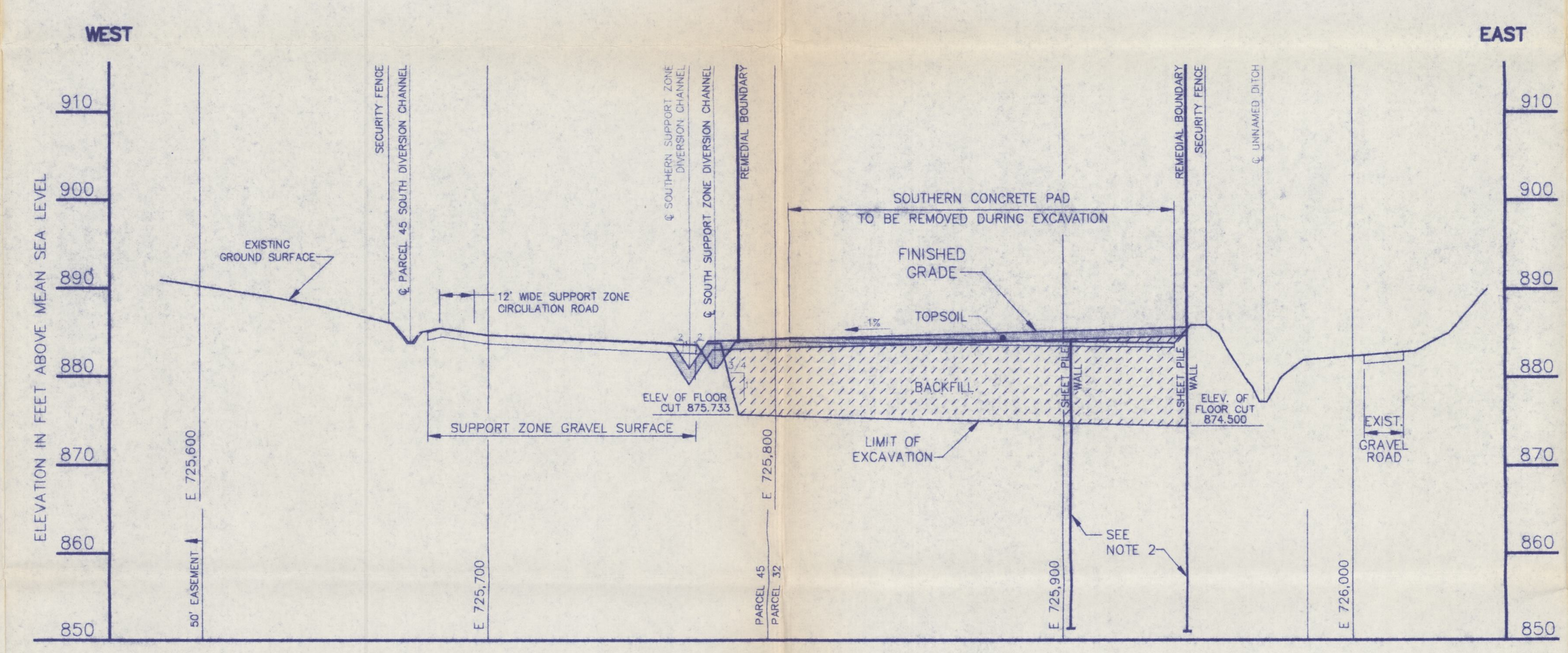
FIGURE 2-6

SUBSURFACE AND SURFACE WATER SAMPLING LOCATIONS
ECC SUPERFUND SITE
ZIONSVILLE, INDIANA

SOURCE: DOW ENVIRONMENTAL DRAWING C-9 REVISION 1 DATED 8/15/96.



SITE CROSS SECTION AT E 725,860 (SEE NOTE 1)
LOOKING EAST



SITE CROSS SECTION AT N 921,700 (SEE NOTE 1)
LOOKING NORTH

NOTES:

1. CROSS SECTION LOCATIONS ARE SHOWN ON DRAWINGS G-2, AND C-1 THROUGH C-7.

2. THE SHEET PILE CUTOFF WALL DEPTH SHALL BE A MINIMUM OF 24 FEET BELOW THE FLOOR ELEVATION OF THE EXCAVATION. THE SHEET PILE CUTOFF WALL SHALL BE EXTENDED THROUGH AND TO THE BASE OF THE UNDERLAYING SAND WATER-BEARING ZONE IN ORDER TO REDUCE EXCAVATION DEWATERING VOLUMES. ADDITIONAL FIELD SUBSURFACE INVESTIGATIONS TO BE CONDUCTED BY THE CONTRACTOR IN ACCORDANCE WITH THE SPECIFICATIONS MAY RESULT IN MODIFICATIONS TO THE EXCAVATION DEPTH AND SHEET PILE CUTOFF WALL ALIGNMENT AND DEPTH.

3. THE CRUSHED PRODUCT AREA SHOWN IS APPROXIMATE IN DIMENSION. ALL CRUSHED CONCRETE AND SUB-BASE MATERIALS NOT USED IN SVE TRENCHES WILL BE PLACED IN THIS AREA.

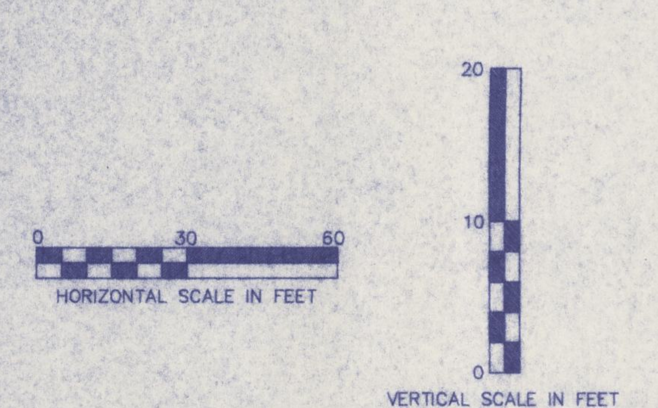


FIGURE 2-2
SITE CROSS SECTIONS
ENVIRO - CHEM SITE
ZIONSVILLE, INDIANA

VERSAR / HANDEX

SOURCE: DOW ENVIRONMENTAL DRAWING C-10, REVISION 0 DATED 11/10/95.

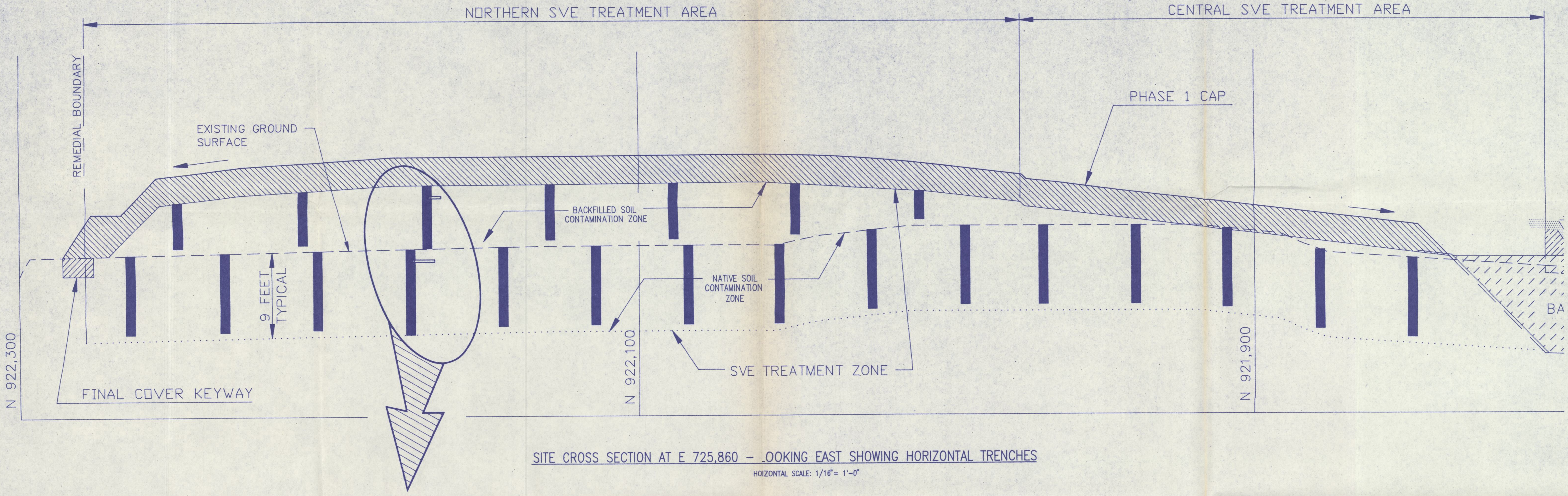
ERM

FIGURE 2-3

GENERAL PROCESS AND INSTRUMENTATION DIAGRAM ECC SITE ZIONSVILLE, INDIANA

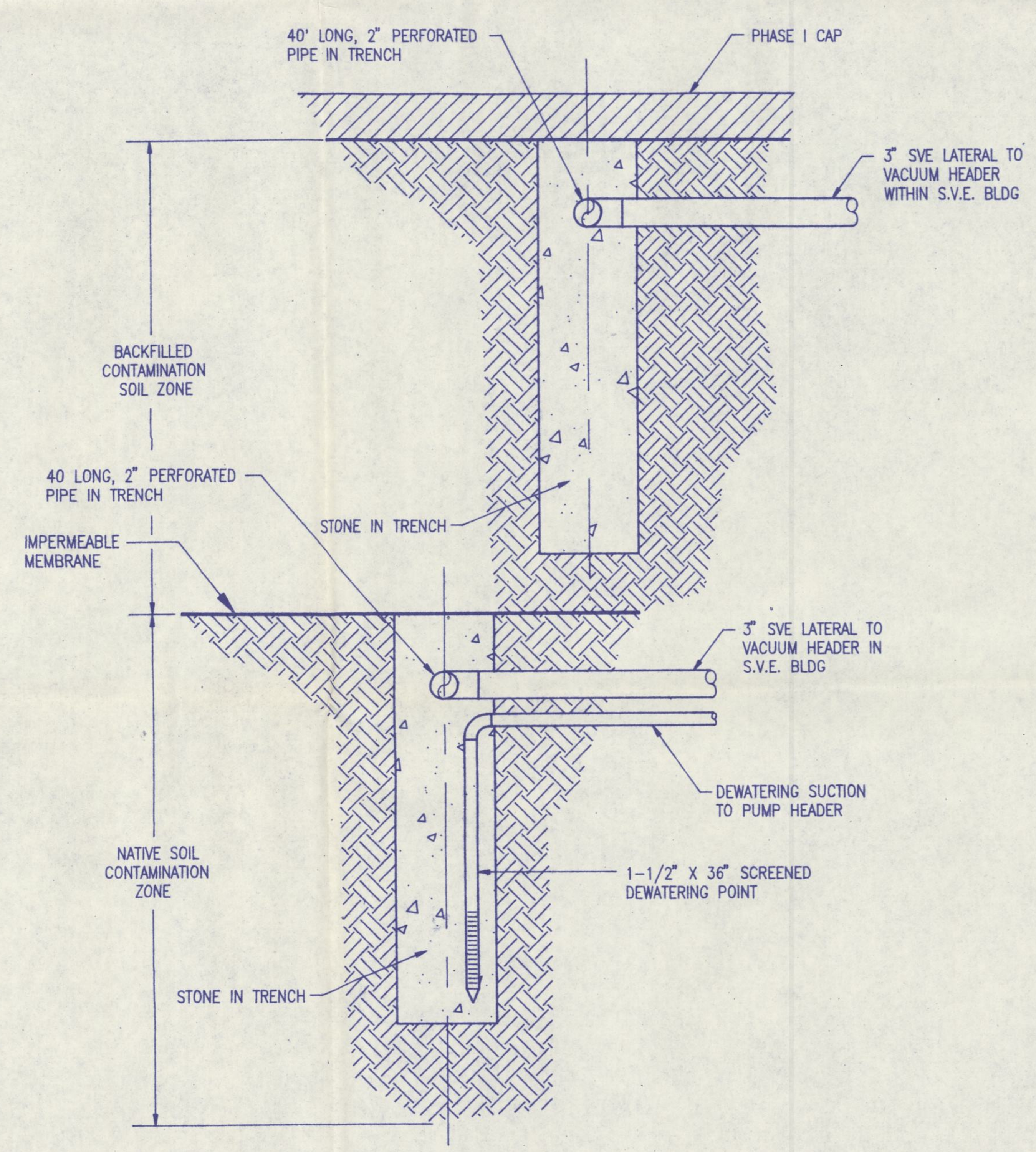
VERSAR/HANDEX

SOURCE: RADIAN INTERNATIONAL FIGURE NUMBER 2-3, DATED 5/20/97.



SITE CROSS SECTION AT E 725,860 – LOOKING EAST SHOWING HORIZONTAL TRENCHES

HOIZONTAL SCALE: 1/16" = 1'-0"



NO.	REVISIONS	BY	APP	DATE

ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION TRUST

DESIGNED C.G.	DATE 07/14/97	ENVIRO–CHEM SUPERFUND SITE
DRAWN J.K.	07/14/97	S.V.E. TRENCH LAYOUT CROSS SECTION
CHECKED G.A.	07/17/97	

Versar INC.
1900 FROST ROAD, SUITE 110
BRISTOL, PA 19007
(215) 788-7844

PROJECT NO. PROPOSAL — SCALE AS NOTED
DRAWING NO. L9707100 — SHEET 1 OF 4

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NO.	REVISIONS	BY	APP	DATE

ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION TRUST

DESIGNED	C.G.	DATE 07/14/97
DRAWN	J.K.	07/14/97
CHECKED	G.A.	07/17/97

Versar INC.
1900 FROST ROAD, SUITE 110
BRISTOL, PA 19007
(215) 788-7844

ENVIRO-CHEM SUPERFUND SITE
PHASE I S.V.E. LAYOUT

PROJECT NO. PROPOSAL — SCALE 1" = 30'-0"
DRAWING NO. L9707101 — SHEET 2 OF 4

EXISTING SITE SECURITY FENCE
REMEDIAL BOUNDARY
EXCLUSION ZONE (WITHIN SITE SECURITY FENCE)
SUPPORT ZONE (WITHIN SITE SECURITY FENCE)
SOUTHERN CONCRETE PAD EXCAVATION AREA
SUPPORT ZONE
MATERIAL LAYDOWN AREA
LIMITS OF CONTRACTOR PARKING
TYPICAL SVE EXTRACTION TRENCH (WITH DEWATERING)
NORTHERN FILL S.V.E. TREAMENT AREA
PHASE II BACKFILLED CONTAMINATED SOIL
EQUIPMENT PARKING
SVE EXTRACTION PIPING (ONLY)
S.V.E. SUPPLY YARD
MAIN SITE ACCESS
12' x 40' LUNCH & SHOWER TRAILER
EXISTING CONCRETE DECONTAMINATION PAD
EXISTING WASTE WATER STORAGE PAD
MODUSTOR TANK T4 43.33' DIA. x 15' DEEP CAPACITY = 150,000 GALLONS
MODUSTOR TANK T3 43.33' DIA. x 15' DEEP CAPACITY = 150,000 GALLONS
MODUSTOR TANK T2 43.33' DIA. x 15' DEEP CAPACITY = 150,000 GALLONS
MODUSTOR TANK T1 43.33' DIA. x 15' DEEP CAPACITY = 150,000 GALLONS
12' WIDE SUPPORT ZONE CIRCULATION ROAD
12' x 50' CONTRACTOR ADMIN. TRAILER
12' x 50' ENGINEERING ADMIN. TRAILER
SUPPORT ZONE
A SOIL VAPOR EXTRACTION SYSTEM BUILDING (OPTIONAL)
C WASTEWATER TREATMENT SYSTEM BUILDING
D WASTEWATER TRANSFER BUILDING
N 922,400
N 922,300
N 922,200
N 922,100
N 922,000
N 921,900
N 921,800
N 921,700
N 921,600
N 921,500
N 921,400
E 726,000
E 725,900
E 725,800
E 725,700
E 725,600
E 725,500
GRAPHIC SCALE IN FT.
CONFIDENTIAL
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NO. REVISIONS BY APP DATE
ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION TRUST
DESIGNED C.G. DATE 07/14/97
DRAWN J.K. 07/14/97
CHECKED G.A. 07/17/97
Versar INC.
1900 FROST ROAD, SUITE 110 BRISTOL, PA 19007 (215) 788-7844
ENVIRO-CHEM SUPERFUND SITE
PHASE II S.V.E. LAYOUT
PROJECT NO. PROPOSAL
SCALE 1" = 30'-0"
DRAWING NO. L9707102
SHEET 3 OF 4

NOTE:

1. AIR INJECTION TO ANY EXTRACTION TRENCH SHALL NOT BEGIN UNTIL 2 SAMPLE EVENTS IDENTIFY THE TRENCH AS "CLEAN".
2. AIR INJECTION PRESSURE SHALL BE LIMITED TO LESS THAN 1/2 AIR EXTRACTION VACUUM LEVEL.
3. VAPOR ANALYZER SHALL BE CALIBRATED FOR A 1 TO 1 RESPONSE FOR 1, 1, 1 TCA AND TCE. RESPONSE FACTORS FOR OTHER COMPOUNDS SHALL BE DETERMINED PRIOR TO INSTALLATION.
4. THE 2400 SCFM VACUUM PUMPING SYSTEM SHOWN, FROM K-1 TO K-2, MAY BE DIVIDED INTO 2 OR MORE SYSTEMS THAT WILL HAVE A COMBINED CAPACITY OF 2400 SCFM.

NO.	REVISIONS	BY	APP	DATE

ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION TRUST

DESIGNED C.G.	DATE 07/14/97	ENVIRO-CHEM SUPERFUND SITE SOIL VAPOR EXTRACTION SYSTEM P & ID
DRAWN J.K.	07/14/97	
CHECKED G.A.	07/17/97	

Versar INC.
1900 FROST ROAD, SUITE 110
BRISTOL, PA 19007
(215) 788-7844

PROJECT NO. PROPOSAL	SCALE NO SCALE
DRAWING NO. L9707103	SHEET 4 OF 4

REVISED EXHIBIT A

MAY 7, 1997

REVISION 2

(redline version of Revision 1)

the southern Concrete Pad Area excavation. The barrier will be designed to deter water from moving into the excavated area and reduce air infiltration into the area of SVE operation. The northern sidewall of the area of excavation will be covered by the barrier and shall be sloped uniformly, based on engineering analyses of barrier stability. A suitable anchor trench will be constructed at the top of the slope to anchor the barrier firmly in place during the backfilling process.

Water Collection System

The vacuum vapor extraction system selected will be capable of entrainment and movement of water which accumulates in the extraction wells and/or trenches. Any free liquid in the extracted vapor will be separated by gravity in an entrainment separator located with the SVE vacuum pumps. A level control system will be utilized to control the removal of water which accumulates in the entrainment separator as required. The separator tank will be equipped either with a vacuum breaker system which will open the tank to the atmosphere or a pump capable of removing the water from the separator while under vacuum to permit water to be transferred by pump from the separator to an on-site water storage tank as necessary. Controls and instrumentation will be protected from the elements. The time required to make the transfer to the separator will depend upon the equipment supplied by the vapor extraction system vendor selected.

The size of the storage tank will be sufficient to store the liquids for a period of time compatible with the selected water handling/treatment method. The tank will be equipped with level measurement and control to advise operating personnel to the status of liquid accumulation in the storage tank. Periodically, the contents of the water storage tank will be removed for treatment and discharged on-site in accordance with the substantive requirements of applicable federal and state laws or, if there is any off-site disposal, in accordance with all requirements of federal and state laws for off-site disposal, if any.

Carbon Adsorption System

The exhaust from the soil vapor vacuum pump system will be piped to a two-stage carbon adsorption system (primary and secondary). At a minimum, this system will consist of two vessels in series containing granular activated carbon. The organics contained in the extracted air will be adsorbed on the activated carbon. The moisture content of the air stream will be less than 50% relative humidity and temperatures will be maintained below 150° F by a cooling system, both acceptable for efficient operation of carbon adsorption.

During the initial phase of operation when organics concentrations in the airstream will be highest, the carbon capacity for the organics is expected to be about 25% by weight. Based on an assumed total mass of organics of about 2,164 pounds (Appendix A), the total quantity of activated carbon required for the entire remediation program is estimated to be 8,700 pounds. These are estimates only and the actual amount of carbon used will depend on the total mass of organics extracted during operation of the SVE system and the carbon adsorption capacity.

The vapor from the primary carbon vessel will be monitored frequently by an on-line organic analyzer. When the organic analyzer detects organic vapor in the airstream at 50 percent of IDEM discharge limitation between the primary and secondary carbon vessels, the vacuum extraction system will shut down automatically to permit the removal and replacement of the "spent" primary carbon vessel. An operator will be alerted to this condition by the shut-down alarm, and will disconnect the primary carbon bed from service. The spent carbon vessel will be removed and replaced by a carbon vessel containing fresh activated carbon. The unit previously serving as the secondary carbon bed will become the primary carbon bed and the unit just placed in operation will be the secondary carbon bed. Once this switch is complete, the SVE system (i.e., vacuum pump and injection pump) will be restarted, and the system operation resumed. The arrangement of two activated carbon vessels in series (i.e., primary and secondary) will permit optimal utilization of the activated carbon, and efficient capture of the organics. The spent carbon vessels will be stored on-site. The vapor extraction equipment supply yard is shown in Figure 2-1, will be located in the support zone and to the extent appropriate, within the Revised Remedial Boundary. The inlet and outlet connections to each carbon vessel will be capped and sealed appropriately. Periodically when a truckload quantity of vessels has accumulated, and at the conclusion of the vacuum extraction program, the vessels containing the spent carbon will be transported in accordance with the requirements of the applicable federal and state laws to an off-site facility where the carbon will be regenerated by high temperature incineration, and in the process, the organics adsorbed on the carbon will be destroyed.

Air Injection System (Optional)

If air reinjection is utilized by the SVE system, the exhaust air from the secondary carbon bed will be piped to the injection pump. The injection pump will be capable of injecting air at pressures up to 10 pounds per square inch gauge (1.65 atmospheres). The discharge from the injection pump will be distributed to the injection wells and/or trenches via a system of manifolds. Control of the injection pump will be interlocked with the vacuum extraction pump. The pipe at each injection point will be equipped with a pressure/vacuum gauge so that injection pressure can be periodically monitored.

Injection manifold piping will allow for modifications and flow reversal.

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